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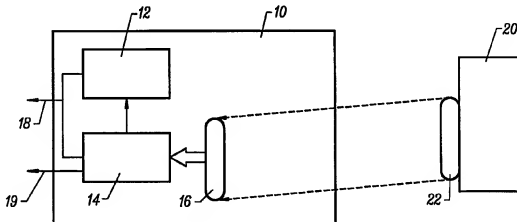
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(54) Title: TELEPHONE DOCKING STATION FOR PERSONAL DIGITAL ASSISTANT



(57) Abstract

A telephone docking station for a personal digital assistant provides a simple docking arrangement in conjunction with a basic telephone circuit that exploits all of the resident intelligence of a PDA in connection with the telephone circuit to extend the PDA's functionality to the telephone, while extending the telephone's communications capability to the PDA. The docking arrangement preferably consists of a docking slot or port provided within the telephone housing itself by which the PDA is readily received and secured to the telephone, and by which an electrical interconnection or infrared (*i.e.* digital) is made to the telephone circuitry within the telephone housing. Software installed on the PDA implements desired communications functions, such as automatic dialing of a phone number stored in the PDA directory, the receipt and transmission of email, provides the ability to access electronic networks, such as the Internet, *e.g.* to browse the World Wide Web, and various custom calling services such as: three-way calling, call forwarding caller-id blocking, and call return.

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TELEPHONE DOCKING STATION FOR PERSONAL DIGITAL ASSISTANT

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BACKGROUND OF THE INVENTION

TECHNICAL FIELD

The invention relates to telecommunications. More particularly, the invention
10 relates to a telephone docking station for a personal digital assistant.

DESCRIPTION OF THE PRIOR ART

A category of portable electronic device, referred to as a personal digital assistant
15 (PDA) provides various productivity applications, such as a calendar and an
address book, in a convenient, hand held form factor. Currently, one of the most
popular PDAs is the Palm Pilot, manufactured by 3Com Corporation. PDA's also
provide certain telecommunications functions through the use of a separate
modem. Such modem may be an external device, as in the case of the Palm
20 Pilot, a built in software modem as in the case of some palm size PCs, or it may
be an internal PC card, as in the case of the Apple Newton, manufactured by
Apple Computer Corporation. The telecommunications functions provided by a
PDA when operated in conjunction with a modem can include the sending and
receiving of email and access to computer networks, such as the Internet.

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It is known to provide a modular computer system, such as would include a PDA,
which may be docked to a base station to provide enhanced functionality, such
as telecommunications capability. See, for example I. Levanon, *Modular
Computer System With Portable Travel Unit*, U.S. Patent No. 4,769,764 (6
30 September 1988); P. Hogdahl, *Modular Computer System Having An Improved
Docking Assembly*, U.S. Patent No. 5,329,427 (12 July 1994); K. Yeh, *Address*

- Mapping Logic For Transferring Data Between A Peripheral Device of a Base Function Expander Unit and A Palmtop Computer As If the Peripheral Was A Peripheral of the Computer*, U.S. Patent No. 5,497,464 (5 March 1996); P. Hogdahl, W. Hart, C. Krallman, K. Shaw, *Modular Computer System Having Self*
- 5 *Contained Workslate Unit Detachably Coupled To Base Unit Including Keyboard*, U.S. Patent No. 5,264,992 (23 November 1993); A. Danielson, D. Durbin, *Pocket Size Data Capture Unit With Processor and Shell Modules*, U.S. Patent No. 5,468,947 (21 November 1995); A. Danielson, D. Durbin, *Core Computer Processor Module, and Peripheral Shell Module Assembled To Form A Pocket*
- 10 *Size Data Capture Unit*, U.S. Patent No. 5,227,614 (13 July 1993); K. Yeh, *Method and Structure For Data Transfer Between A Standard Port of A Host Computer and A Custom Port of A Palmtop Computer Using A Docking Station*, U.S. Patent No. 5,666,495 (9 September 1997); D. Schultz, A. Danielson, A. Bunte, R. Sherman, R. Jaeager, *Portable Dock For A Portable Electronic Device*,
- 15 U.S. Patent No. 5,644,471 (1 July 1997); T. Spalding, K. Kowal, J. Bleck, S. Wakefield, J. Thrailkill, *Portable Computer with Docking Connector For Peripheral Devices*, U.S. Patent No. 5,187,645 (16 February 1993); D. Schultz, A. Danielson, A. Bunte, R. Sherman, R. Jaeger, *Portable Electronic Device Docking system*, U.S. Patent No. 5,544,010 (6 August 1996); D. Kikinis, P. Dornier, W. Seiler, *Digital Assistant System Including A Host Computer With A Docking Bay*
- 20 *for the Digital Assistant Wherein A Heat Sink Is Moved Into Contact with a Docked Digital Assistant for Cooling the Digital Assistant*, U.S. Patent No. 5,689,654 (18 November 1997); P. Davis, *Recharging and Data Retrieval Apparatus*, U.S. Patent No. 5,052,943 (1 October 1991); K. Cargin, D. Boatwright, S. Kelly, W. Gibbs, *Hand Held Computerized Data Collection*
- 25 *Terminal with Rechargeable Battery Pack Sensor and Battery Power conservation*, U.S. Patent No. 5,602,456 (11 February 1997); P. Davis, *Data Communication System with Adapter for Removable Coupling of Portable Data Terminals*, U.S. Patent No. 5,625,555 (29 April 1997); E. Dials, D. Herring, A. Hodges, S. Luglan, *Computer System Having Cooperating Spring, Gear Tracks*
- 30 *and Geared Dampers For Allowing A Drive Housing To Move Between Open and Closed Positions*, U.S. Patent No. 5,712,761 (27 January 1998); K. Cargin, R.

- Mahany, D. Durbin, D. Boatwright, S. Kelly, D. Schultz, W. Gibbs, *Hand-Held Computerized Data Collection Terminals With Rechargeable Battery Pack Sensor and Battery Power Conservation*, U.S. Patent No. 5,515,303 (7 May 1996); P. Miller, R. Traeger, J. Kubler, K. Cargin, G. Hanson, P. Davis, D. Schultz, *Data Communications System With Communicating and Recharging Docking Apparatus For Hand-Held Data Terminal*, U. S. Patent No. 5,195,183 (16 March 1993); P. Miller, S. Koenck, J. Walter, J. Kubler, K. Cargin, G. Hanson, P. Davis, S. Kunert, D. Schultz, *Data Capture System With Communicating and Recharging Docking Apparatus, and Modular Printer and Hand-Held Data Terminal Means Cooperable Therewith*, U.S. Patent No. 5,331,580 (19 July 1994); D. Schultz, A. Danielson, R. Jaeger, A. Bunte, R. Sherman, *Terminal and Docking Mechanism With Open Channel Members and Guide Rollers*, U.S. Patent No. 5,408,382 (18 April 1995); W. Goodman, C. Hattan, J. Sherman, P. Wormsbecher, *Docking Station For A Portable Computer With A Hinged Support Frame and Movable Receptacle Assembly*, U. S. Patent No. 5,633,782 (27 May 1997); and E. Flint, J. Karidis, G. McVicker, W. Pence, *A cartridge-based design for portable and fixed computers*, European Patent Application No. EP0722138.

- It is also known to provide various form factors and features for a telephone. See, for example D. Kikinis, P. Dornier, *Smart Phone*, U.S. Patent No. 5,633,920 (27 May 1997) and Ascom Carry, Dacon Electronics PLC (copyright PSion PLC 1997).

- With regard to the smart phone disclosed in the Ö920 patent, a substantial cost of manufacture is encountered in producing the telephone, for example in providing the electronics and software necessary to implement the various intelligent features offered by the telephone's design. While such smart phone is able to accommodate a device, such as a PDA, in a cutaway slot, such that the telephone allows operation of various features of the PDA in connection with operation of the telephone, the PDA typically operates under control of the smart phone, much like a peripheral device, and does not operate or control the smart phone itself.

With regard to the Ascom Carry device, a sidecar type adapter is provided that connects a PDA (in this case, a Psion PDA) to a smart telephone, such that the smart telephone can use the address book feature of the PDA. Thus, only limited
5 functionality of the PDA is used by the smart telephone. Such telephone itself is an expensive and complicated electronic device. The Ascom Carry device is limited to expensive, already-smart PBX telephones which have an external port. It has no modem and is limited to controlling telephony functions, no Internet functionality is possible.

10

Also known is a dedicated "Web phone," such as the iphone, manufactured by Cidco, or the Nokia 9000. While these devices are very well integrated, they are expensive and provide all or nothing" functionality (*i.e.* they are not adapted to exploit the functionality of an outboard device, such as a PDA, but rather must
15 include full functionality for performing all "Web" functions).

20

Thus, in the prior art it is known to dock a first expensive and complicated electronic device, *e.g.* the PDA, with a second expensive and complicated electronic device, *e.g.* the smart telephone, to allow the smart telephone to access information, typically in the form of address book entries, contained in the PDA. Certain limited use of the PDA's display may also be made, as with the Ascom Carry device.

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It would be advantageous to provide a simple docking arrangement in conjunction with a basic telephone circuit that could exploit all of the resident intelligence of a PDA in connection with such telephone circuit without having to duplicate such intelligence in the telephone itself. It would be further advantageous to provide a docking arrangement that readily receives any PDA; that includes software resident on the PDA that implements any desired
30 communications function, such as the receipt and transmission of email, the ability to access an electronic network, such as the Internet, *e.g.* to browse the World Wide Web; that provides a convenient means to use various custom local

area signaling services (CLASS); and that exploits the programmable computer system inherent in the PDA, while simplifying the communications hardware required by the docking element, *i.e.* the telephone, of the arrangement.

5

SUMMARY OF THE INVENTION

The invention provides a telephone docking station for a personal digital assistant (PDA). The preferred embodiment of the invention provides a simple docking arrangement in conjunction with a basic telephone circuit that exploits all of the resident intelligence of a PDA in conjunction with the telephone circuit. The docking arrangement preferably consists of a docking slot or port provided within the housing itself by which the PDA readily received and securely retained (at least partially) within the telephone housing, and by which an electrical interconnection is made to the telephone circuitry within the telephone housing. Software installed on the PDA implements desired communications functions, such as the receipt and transmission of email, provides the ability to access electronic networks, such as the Internet, *e.g.* to browse the World Wide Web, and provides a convenient means to use various custom local area signaling services (CLASS).

20

Significantly, the invention exploits the programmable computer system inherent in the PDA, while simplifying the communications hardware required by the docking element of the arrangement. In this way, an inexpensive telephone/modem may be provided that both extends the telecommunication capability of a PDA, while allowing use of the PDA's internal functionality. Thus, a basic telephone/modem circuit in a simple housing can import the full functionality of the computer within the PDA, including the CPU, the display, the memory, and the data I/O features, such as a touch screen and/or keyboard. As a result, the basic telephone becomes a smart telephone based upon the PDA's intelligence, while the PDA becomes a full featured communications device.

30

Because most of the cost of production of such system is required to manufacture the PDA, the invention migrates all required communications functionality to the PDA in the form of software, while requiring only a basic and inexpensive hardware interface (typically, a housing, a connection port, and a
5 modem/telephone chip) between the PDA and the user's telephone service.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block schematic diagram showing a telephone docking station and a
10 PDA according to the invention;

Fig. 2 is a block schematic diagram of a PDA;

Fig. 3a is an illustration of a telephone docking station and a PDA according to a
15 first embodiment of the invention;

Fig. 3b is an illustration of a telephone docking station having a PDA docked
thereto according to the first embodiment of the invention;

20 Fig. 4 is a screen display for a PDA that illustrates dialing status according to the invention;

Fig. 5 is a screen display for a PDA that illustrates redialing status according to
the invention;

25

Fig. 6 is a screen display for a PDA that illustrates a call being received according
to the invention;

Fig. 7 is a screen display for a PDA that illustrates a speed dialing function
30 according to the invention;

Fig. 8 is a screen display for a PDA that illustrates telephony class functions according to the invention;

- 5 Fig. 9 is a screen display for a PDA that illustrates a caller log according to the invention;

Fig. 10a is an illustration of a telephone docking station and a PDA according to a second, equally preferred embodiment of the invention;

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Fig. 10b is an illustration of a telephone docking station having a PDA docked thereto according to the second embodiment of the invention;

- 15 Fig. 11a is an illustration of a docking station and a PDA according to a third, equally preferred embodiment of the invention;

Fig. 11b is an illustration of the telephone docking station 52 having the PDA 51 docked thereto according to the third embodiment of the invention; and

- 20 Fig. 12 is a block schematic diagram showing a first implementation for the docking telephone according to the invention;

Fig. 13 is a block schematic diagram showing a second implementation for the docking telephone according to the invention; and

25

Fig. 14 is a block schematic diagram showing a third implementation for the docking telephone according to the invention.

DETAILED DESCRIPTION OF THE INVENTION

The invention provides a telephone docking station for a personal digital assistant (PDA). The preferred embodiment of the invention provides a simple docking arrangement in conjunction with a basic telephone circuit that exploits all of the resident intelligence of a PDA in conjunction with the telephone circuit. The docking arrangement preferably consists of a docking slot or port provided within the telephone housing itself by which the PDA readily received and securely retained (at least partially) within the telephone housing, and by which an electrical interconnection is made to the telephone circuitry within the telephone housing. Software installed on the PDA implements desired communications functions, such as the receipt and transmission of email, provides the ability to access electronic networks, such as the Internet, *e.g.* to browse the World Wide Web, to allow dialing from the address book, from Web pages, and from email messages containing telephone numbers, and to provide a convenient means to use various custom local area signaling services (CLASS) such as three-way calling, call forwarding caller-id blocking, call return.

Significantly, the invention exploits the programmable computer system inherent in the PDA, while simplifying the communications hardware required by the docking element of the arrangement. In this way, an inexpensive telephone/modem may be provided that both extends the telecommunication capability of a PDA, while allowing use of the PDA's internal functionality. Thus, a basic telephone/modem circuit in a simple housing can import the full functionality of the computer within the PDA, including the CPU, the display, the memory, and the data I/O features, such as a touch screen and/or keyboard. As a result, the basic telephone becomes a smart telephone based upon the PDA's intelligence, while the PDA becomes a full featured communications device.

Because most of the cost of production of such system is required to manufacture the PDA, the invention migrates all required communications functionality to the PDA in the form of software, while requiring only a basic and

inexpensive hardware interface (typically, a housing, a connection port, and a modem/telephone chip) between the PDA and the user's telephone service.

- Fig. 1 is a block schematic diagram showing a telephone docking station and a PDA according to the invention. The telephone docking station 10 comprises an electrical port 16 that establishes an electrical connection with a complementary port 22 provided by the PDA 20. It will be appreciated that the port 16 may be specifically tailored to a particular PDA, such as the Palm Pilot or PSION, and therefore would comprise a connector that mates with the connector provided on the PDA. In other embodiments of the invention, the port 16 may provide a universal interface, a standard interface having adapters for each of the various popular PDAs, or an infrared, RF, or inductive interface. Further, in the case of an infrared or RF interface, the port 16 may be an infrared sensor or RF antenna. Further, the telephone docking station may provide a port for establishing the exchange of data with said PDA, where the port is either integrated with a docking mechanism for physically securing the PDA to the telephone docking port or where the port is separate therefrom, for example where the port is an IR port or separate electrical connector.
- The telephone docking station 10 further comprises a telephone circuit 14 for implementing basic telephony features, such as telephone line interface, on-hook/off-hook sense/control, line isolation, ringing, DTMF generation, and dialing. The telephone circuit may be any of the presently available hybrid circuits or it may be an integrated telephone circuit. The output of the telephone circuit (and modem, discussed below) is coupled to a standard telephone connector 18, such as an RJ-11 (in the United States). It will be appreciated that the telephone docking station herein described may provide any line connector as is appropriate for the locality in which the device is used.
- The telephone docking station also comprises a modem 12 (if desired) to implement the exchange of digital information over the telephone line and thereby allow network access and email functions. The modem may be any of the

presently available modem devices, for example as are manufactured by Rockwell Corporation. Some PDA's, such as some palm size PCs, include a built-in modem. In such cases, it is not necessary to build a modem into the docking telephone.

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The telephone docking station may also provide a data port 19 that allows the telephone to be connected to a user's computer, for example to synchronize the PDA calendar or address book with applications on the computer, or to exchange files and/or software between the PDA and the user's computer. In this way, the need for an outboard docking station for use with a computer is eliminated.

10

The PDA is connected by default to the modem. When the PDA button built into the telephone is pressed, the PDA is connected to the PC instead of the modem and the PDA then operates in Hot Synch mode. When the synchronization operation ends, the PDA returns to modem state.

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In default mode, the PDA complements the telephone with an address book, Class functions, and convenient dialing functions. In this mode, the telephone provides physical access to the Internet and enables the use of Web applications on the PDA.

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Fig. 2 is a block schematic diagram of a PDA. A PDA 20 typically includes a data exchange port 22, which may provide an electrical, optical, or RF data exchange connection; a CPU 25, a memory 24 for storing a program 29, a display 26, and an data entry device 27, such as a touch screen and/or keyboard. It will be appreciated by those skilled in the art that the invention is readily implemented with any of the various popular PDAs, the only requirements being the provision of a data exchange port to allow the PDA to exchange information with the telephone line via the telephone docking station and the ability to load and store a communications program. With regard to the communications program 29 (see Fig. 2), the program resides in the PDA's memory; is typically loaded into the

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30

PDA through the data exchange port or via external memory, such as provided by a memory card; and implements any desired telecommunications function. The actual program is readily provided by those skilled in the art. Further, various commercial communications packages are presently available for such PDAs as the Palm Pilot and PSION.

The various telecommunications functions can include any or all of dialing from an address book in the PDA, displaying caller ID information, call logging/time keeping, speed dial, CLASS functions, dialing from a web page, and answering machine (using the PDA's memory for voice message storage). With regard to network functions, the PDA software would include various modem protocols and/or such protocols as TCP/IP to enable the sending and receiving of email and Internet access. Accordingly, any email client and/or web browser may be included in the PDA software. The telephone itself merely provides a connection to the PDA, for example via a serial port, a power supply, a phone connector, a telephone circuit, and a modem (alternatively, the modem may be implemented in software in the PDA). The PDA provides all of the higher level functionality. The docking station is operational as a simple telephone when the PDA is not docked to it. The docking station is also operational as a telephone when the power supply is disconnected.

With regard to dialing from a Web page (stated above): When the Web browser detects a string of numbers that looks like a telephone number, the string of numbers is automatically converted to a link in URL format. This link points to an internal callback function in the PDA software that performs the dialing if the user selects the link.

The invention integrates the PDA and a simple telephone function using a docking station that is less expensive to manufacture than an outboard modem typically available for use with the PDA. A main reason for this is the higher price of low power consumption components used for portable battery operated modems. Further, the invention provides a useful form factor (the telephone) for

extending the functionality of a PDA, while at the same time allowing a PDA owner to use the PDA's internal capabilities to implement a smart telephone and/or telecommunications and data exchange computer. Unlike the prior art, the telephone itself is no more expensive than a standard telephone (and a
5 modem it not built in the PDA) because it does not need any of the expensive hardware such as a display, CPU, and memory, or software that is necessary to implement the smart telephone features, the PDA providing this functionality. Thus, the invention reuses the PDA's complement of functional elements within the context of a communications device. Unlike a modem, which may be used
10 with a typical PDA, the invention is a telephone whether or not the PDA is docked thereto. Thus, the telephone docking station may be used as a standard telephone in the absence of the PDA. This is not presently possible with prior art modems and PDA docking stations. Further, because the telephone performs multiple functions, the user's desktop is not cluttered with outboard devices to
15 connect the PDA to a computer or telephone line.

It will be appreciated by those skilled in the art that the invention is readily provided in various form factors.

20 Fig. 3a is an illustration of a telephone docking station and a PDA according to a first embodiment of the invention. In Fig. 3a a telephone docking station 32 includes a docking port 30 for a PDA 30, such as a PSION. The docking port preferably includes an electrical connection to the PDA's data exchange port (typically a serial port), although an electrical connection is not required in the
25 case an IR or RF data exchange facility is provided. The docking port may also provide electrical power to the PDA to either operate the PDA and/or charge the pDA's batteries, if desired.

There is no obligation for the PDA to be rigidly connected to the docking station.
30 Because the screen format of most PDAs is small the PDA can be connected with a spring cord (or infrared) in a way that it can be retractable from the docking station but still be electrically connected.

Because some PDAs already include a microphone and a speaker, there is no obligation for a handset. In this case when the PDA is docked it performs as a speakerphone.

5

The docking port is also preferably configured to accept and securely retain at least a portion of the PDA 31 so that the PDA may be operated while docked to the telephone docking station. The PDA is typically retained in such manner that at least the display and data entry features, such as a touch screen and/or keyboard, are readily accessible by a user. Fig. 3b is an illustration of the telephone docking station 32 having the PDA 31 docked thereto according to the first embodiment of the invention.

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Software Interfaces

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The protocol between the PDA and the modem should enable the PDA to control the modem and to get event signals and data from the modem when events occurred or data is available.

20 Control commands include:

- Dial
- Pick Up
- Hang Up
- Get Line Status
- Get Data (e.g. Caller ID)

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30

Whenever an event such as ring, call waiting, or caller ID occurs, the modem sends a signal to the PDA. If the PDA is turned off, the modem may turn the PDA on so that the PDA eventually updates the call log database.

- 5 Optionally, a protocol such as AT+V, may be used to control the modem whenever available APIs, such as TAPI (Telephony Application Programming Interface) may be used while implementing the PDA software.

User Interfaces

10 **Input Means**

The following are the optional user interfaces:

- 15 1. Keypad, numbers 0 to 9, *, #, FLASH, MUTE, HOLD, SYNC, speaker (for speaker phone).
2. PDA button to control PDA connection to the telephone line via the modem versus connection to the PC.
- 20 3. Handset.
4. Alphanumeric Keyboard for PDA device.

Readability

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Most PDAs are designed for operation as a hand held device (and not as a desktop device). This means that the user reads from a short distance – the user holds the PDA in his or her palm and can bring it closer if the distance is too big.

There are two options for DDS:

- Use bigger fonts and icons for all the relevant screens;
- 5 • Attach the PDA to the Docking telephone by a retracting cord.

Telephony Screens

The following discussion relates to Figs. 4-9, which illustrate various screens that
10 are displayed on the PDA in connection with operation of the invention:

- Dialing Status: Fig. 4 is a screen display for a PDA that illustrates dialing
status according to the invention;
- 15 • Redialing Status: Fig. 5 is a screen display for a PDA that illustrates redialing
status according to the invention;
- Receiving a Call: Fig. 6 is a screen display for a PDA that illustrates a call
20 being received according to the invention;
- Speed Dial Screen: Fig. 7 is a screen display for a PDA that illustrates a
speed dialing function according to the invention;
- 25 • Telephony Class Features: Fig. 8 is a screen display for a PDA that illustrates
telephony class functions according to the invention; and

- Caller Log: Fig. 9 is a screen display for a PDA that illustrates a caller log according to the invention.

Hardware Interfaces

- 5 The docking telephone described herein requires jacks, cables, and connectors not normally found on a standard telephone.
 1. Serial port connector to connect the docking telephone to a PC for Synchronization (HotSync).
- 10 2. PDA docking serial connector, compatible with specific PDAs.
3. RJ11 telephone jack for the telephone line.
- 15 4. Power supply with plug suitable to country of service. The AC side of the power supply should comply with major national market requirements.

Communication Interfaces

The docking telephone supports POTS communication with touch tone dialing. The communications interface with the PDA and with the PC is serial. If an
5 internal modem is not supplied, then the docking telephone provides a serial interface for the modem.

User Characteristics and Environmental Requirements

The user may want to disconnect the PDA and use it offline for such typical PDA
10 applications as address book maintenance, scheduling meetings, and portable telephone book. The user may periodically connect the PDA to the PC to upload/download personal data, such as new telephone numbers, and possibly to print out data and perform data maintenance. The user may also want to use the PDA to ease the use of his telephone, access Web sites and email via his
15 telephone, perhaps use Web access for such applications as on-line yellow pages, or have the convenience of access to Web access while away from the PC in the office. It is possible that the docking telephone is used in a hot and humid kitchen. Because the docking telephone does not especially require a PC, it may be used in many rugged non-office environments where a telephone or a
20 telephone and a PDA are used today. For example – a person uses the integrated smart phone to read email and selected Web sites before going to sleep; during the night the smart phone automatically polls the email; the person reads the email on the way to work. The docking telephone may be used in a domestic setting, including a kitchen, or in an office in any type of industrial
25 environment.

Fig. 10a is an illustration of a telephone docking station and a PDA according to a second, equally preferred embodiment of the invention. In Fig. 10a a telephone docking station 42 includes a docking port 40 for a PDA 41, such as a Palm Pilot.

Fig. 10b is an illustration of the telephone docking station 42 having the PDA 41 docked thereto according to the second embodiment of the invention.

Fig. 11a is an illustration of a docking station and a PDA according to a third, equally preferred embodiment of the invention. In Fig. 11a a docking station 52 includes a docking port 50 for a PDA 51, such as a Palm Pilot, but does not include a telephone handset. In this embodiment of the invention, the microphone and speaker of the PDA are used for telephonic communication. Fig. 11b is an illustration of the telephone docking station 52 having the PDA 51 docked thereto according to the third embodiment of the invention.

Specific Hardware Implementations

Fig. 12 is a block schematic diagram showing a first implementation for the docking telephone 120 which may be connected to either a PC, *e.g.* for synchronizing the PDA 125, or to a telephone line 129. In this implementation standard components are used. For example, the docking telephone is powered by a standard low voltage power supply 117.

The modem 121 is a standard modem with dialing, and optionally Class features functionality. In addition, the docking telephone has an internal switch (relay) 122 that disconnects (mutes) the telephone when the modem is connected for data transfer. This functionality is found on most standard modems. The switch operates a switching circuit 119 to effect an appropriate connection to the telephone line.

The telephone circuit 123 is a standard POTS telephone that includes a handset 127. The optional RS232 adapter circuit 124 is the same as the adapter circuit found inside the standard PDA cradle (for those PDAs that require such an adapter). A sync request switch 118 is provided to alert the PDA when synchronization with a PC is desired, *i.e.* when the PDA is coupled to a PC

The switch circuitry is either mechanically operated by the user or electronically controlled by the PDA software. Normally, the modem is connected to the PDA 125 through this switch. A key advantage of this implementation is the use of standard components. One disadvantage is that dialing operations performed by the user using the telephone keypad are not transferred to the PDA and thus can not be stored in the PDA's redial-list for future redial operations.

Fig. 13 is a block schematic diagram showing a second implementation for the docking telephone 130. In this implementation, a special controller circuit 131 is used to control the modem 132, the telephone 133 (which includes a handset 136), and PC synchronization (if selected and initiated by actuation of the sync request switch 139). The telephone circuit receives commands from the controller. The controller in this implementation interfaces between the PDA 125 on one side and the telephone, the modem, and the PC 128 on the other. In addition, the electronic switch for PC synchronization and the RS232 adapter 124/135 (if required) may be implemented as part of the controller. Further, a telephone keypad (not shown) may be included for telephone line signaling and for operation of the controller (off-line mode), for example to communicate with the PDA to capture keystrokes, *e.g.* for redialing and address book entry from the telephone.

Fig. 14 is a block schematic diagram showing a third implementation for the docking telephone 140. This implementation is used when the PDA 125 already includes a built-in modem. A loop current sense circuit is implemented as part of the telephone 142 (which includes a handset 146). When the PDA's modem is connected for data transfer, the telephone is muted using an internal relay (switch) 143. This relay is controlled by the loop current sense circuit. This implementation of the invention may also include an RS232 adapter (not shown) if necessary. The PDA in this case provides both a line signal for telephonic communications and a synchronization signal (actuated by operation of the sync request switch 148) to allow the PDA to be synchronized with a PC.

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Although the invention is described herein with reference to the preferred embodiment, one skilled in the art will readily appreciate that other applications may be substituted for those set forth herein without departing from the spirit and scope of the invention. Accordingly, the invention should only be limited by the

5 Claims included below.

CLAIMS

1. A telephone docking station for a personal digital assistant (PDA), comprising:

5 a housing;

a docking port provided by said telephone housing for receiving and securely retaining said PDA in contact with said housing, wherein display and control elements of said PDA remain accessible when said PDA is in contact with said housing;

10 a telephone circuit for providing basic telephony features, said telephone circuit being connected to a telephone line;

means for establishing data exchange between said PDA and said telephone circuit; and

15 a program, stored within a memory on said PDA, for implementing any desired communication function in conjunction with said telephone circuit.

2. The telephone docking station of Claim 1, further comprising:

a modem, within said housing, and in communication with said PDA for implementing the exchange of digital information over said telephone line.

20

3. The telephone docking station of Claim 1, wherein said communication function includes any of receipt and transmission of email, access to electronic networks, and CLASS functions.

25 4. The telephone docking station of Claim 1, wherein said PDA further comprises:

a CPU;

a display; and

data I/O features.

30

5. The telephone docking station of Claim 1, wherein said means for establishing data exchange comprises:

an electrical port that establishes an electrical connection with a complementary port provided by said PDA.

6. The telephone docking station of Claim 1, wherein said docking port comprises:
- 5 a universal interface.

7. The telephone docking station of Claim 1, wherein said means for establishing data exchange comprises:
- 10 a standard interface having adapters for any of various PDAs.

8. The telephone docking station of Claim 1, wherein said means for establishing data exchange comprises:
- any of an infrared, RF, or inductive interface.
- 15

9. The telephone docking station of Claim 1, further comprising:
- a data port for connecting said PDA to a user's computer via said means for establishing data exchange.

- 20 10. The telephone docking station of Claim 1, basic telephony features comprising any of:
- dialing from an address book that is resident in said PDA, caller ID, call logging/time keeping, speed dial, CLASS functions, POTS mode, dialing from a web page, answering machine using said PDA memory for voice message
- 25 storage, and network functions, wherein said network functions comprise any of sending and receiving of email and Internet access.

11. The telephone docking station of Claim 1, wherein said telephone docking station may be used as a standard telephone in the absence of said PDA.

30

12. The telephone docking station of Claim 1, further comprising:
- means for providing electrical power to said PDA.

13. A telephone docking station for a personal digital assistant (PDA), comprising:

a housing;

5 a docking port provided by said telephone housing for receiving and securely retaining said PDA in contact with said housing, wherein display and control elements of said PDA remain accessible when said PDA is in contact with said housing;

a telephone circuit for providing basic telephony features, said telephone
10 circuit being connected to a telephone line;

means for establishing data exchange between said PDA and said telephone circuit;

a program, stored within a memory on said PDA, for implementing any desired communication function in conjunction with said telephone circuit; and

15 a modem, within said housing, and in communication with said PDA for implementing the exchange of digital information over said telephone line;

wherein said telephone docking station may be used as a standard telephone in the absence of said PDA.

20 14. The telephone docking station of Claim 13, wherein said means for establishing data exchange comprises:

an electrical port that establishes an electrical connection with a complementary port provided by said PDA.

25 15. The telephone docking station of Claim 13, wherein said docking port comprises:

a universal interface.

30 16. The telephone docking station of Claim 13, wherein said means for establishing data exchange comprises:

a standard interface having adapters for any of various PDAs.

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17. The telephone docking station of Claim 13, wherein said means for establishing data exchange comprises:

any of an infrared, RF, or inductive interface.

5 18. The telephone docking station of Claim 13, further comprising:

a data port for connecting said PDA to a user's computer via said means for establishing data exchange.

19. The telephone docking station of Claim 13, wherein said docking port and

10 said means for establishing data exchange are integrated.

20. The telephone docking station of Claim 13, further comprising:

means for providing electrical power to said PDA.

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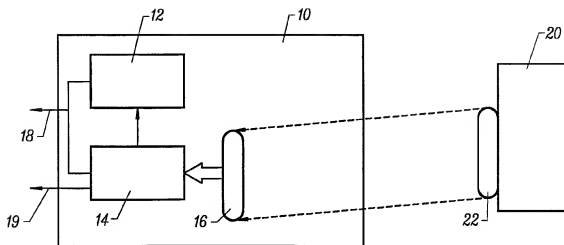


FIG. 1

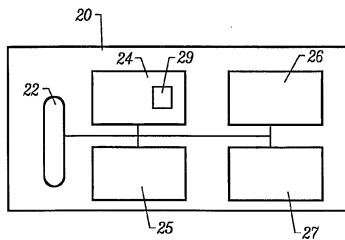


FIG. 2
(PRIOR ART)

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Dialing	
7440435	
00:01:34	
Speed	Class Redial

FIG. 4

Redial	
800-881-7256 PalmPilot Ac...	
09-7440435 InfoGear	
1-800-527070	
Cancel	Clear

FIG. 5

Caller:	
7440435	
John Doe	
00:01:34	
Speed	Class Redial

FIG. 6

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Speed Dial		
 Home		
	 Mom	 Mike
Cancel	Class	Redial

FIG. 7

Speed Dial		
Call Forward	Voice Mail	3-Way Call
Last Call Return		
Cancel	Speed	Redial

FIG. 8

Call Log
800-881-7256 PalmPilot Ac...
09-7440435 InfoGear
1-800-527070
Cancel Clear

FIG. 9

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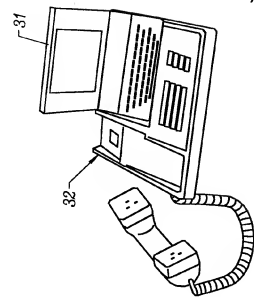


FIG. 3B

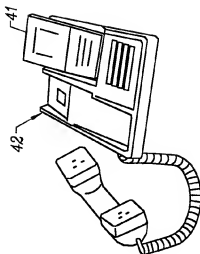


FIG. 10B

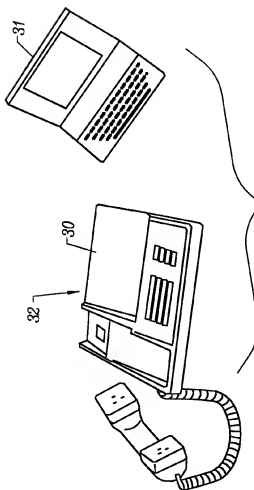


FIG. 3A

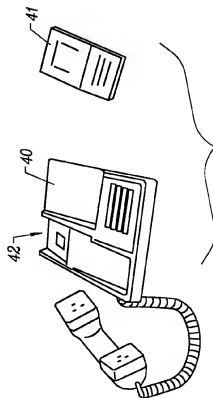


FIG. 10A

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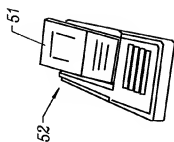


FIG. 11B

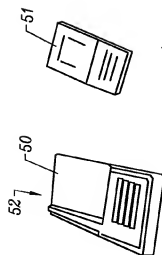


FIG. 11A

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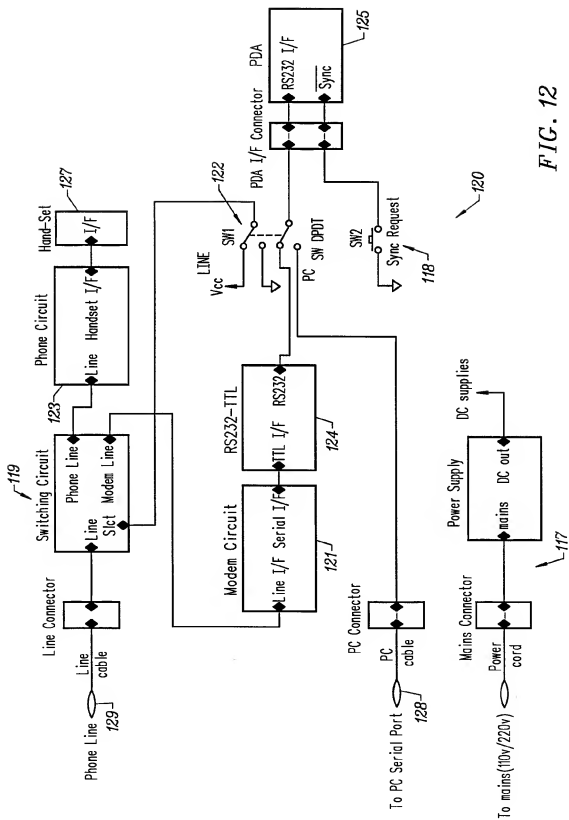


FIG. 12

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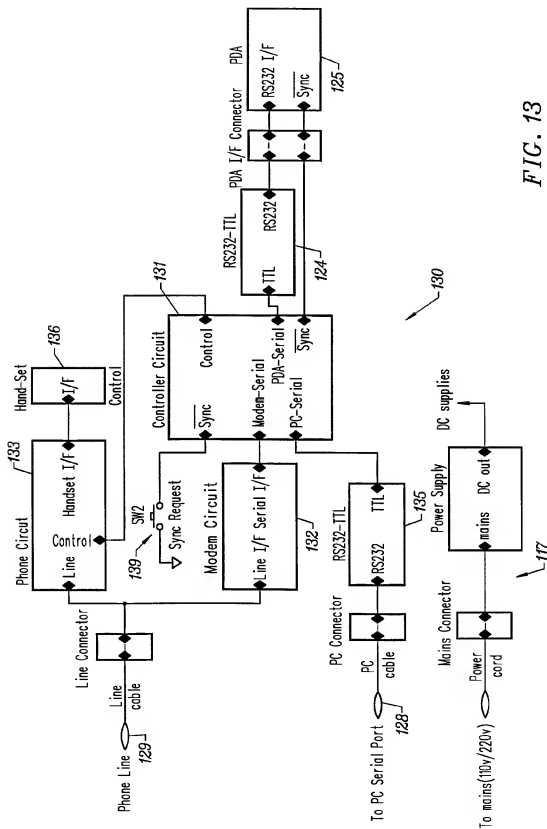


FIG. 13

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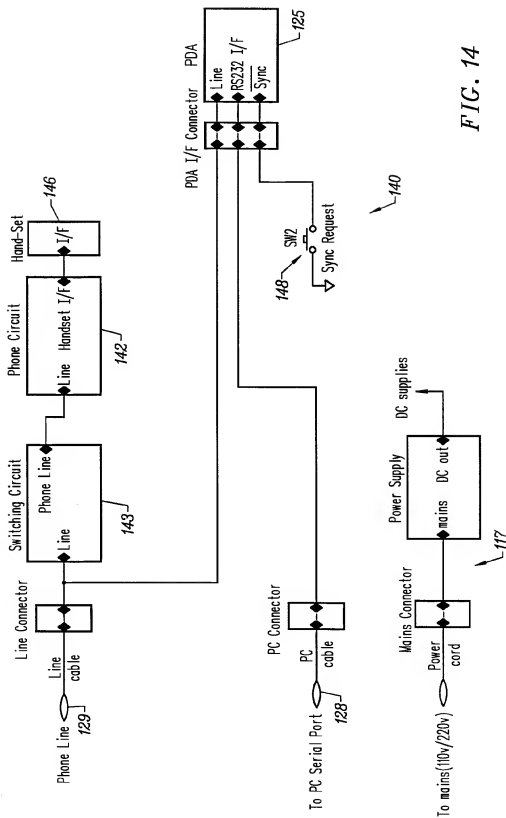


FIG. 14

INTERNATIONAL SEARCH REPORT

International Application No.

PCT/US 99/11595

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 6 H04M1/00 G06F1/16

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 G06F H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 704 788 A (AT & T CORP) 3 April 1996 (1996-04-03) column 2, line 5-19 column 5, line 17-58; figures 7-9 column 6, line 28,29 column 6, line 52 - column 7, line 2 ---	1,2,4,5, 11-14, 19,20
X	US 5 675 524 A (BERNARD MARC ALLEN) 7 October 1997 (1997-10-07) column 3, line 45 - column 4, line 5; figure 3 column 4, line 58 - column 5, line 10; figure 4 column 8, line 52-65; figure 6 column 9, line 28-51 column 5, line 10-14 ---	1,2,4,5, 12
A	---	9
	--- -/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

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"O" document referring to an oral disclosure, use, exhibition or other means

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"Z" document member of the same patent family

Date of the actual completion of the international search

31 August 1999

Date of mailing of the international search report

07/09/1999

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de Biolley, L

INTERNATIONAL SEARCH REPORT

International Ap. ution No

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document with indication, where appropriate, of the relevant passages	Relevant to claim No
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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